

JAMES B. PENNY	11	CONVERT - HEX, DEC, OCT, & BINARY
K. D. KOPPERT	13	LIFE (ASSEMBLER)
K. D. KOPPERT	15	LIFE 2 (ASSEMBLER)
K. D. KOPPERT	17	LINE RENUMBERING (ASSEMBLER)
STEVE MACGREGOR	19	MULTIPLIES 16-BIT POS. NO.
H. PHELPS GATES	20	LEVEL II BASIC RENUMBERING
H. PHELPS GATES	20	KEYBOARD DEBOUNCER

CHANGE TO BIOCHART BY RAY LUNKWITZ
NEWSLETTER - VOL. 1, # 1 - PAGE 4

```
620 A1=((SIN((F1*F5)*.0174533)*-30)+30)
630 A2=((SIN((F2*F6)*.0174533)*-30)+30)
640 A3=((SIN((F3*F7)*.0174533)*-30)+30)
```

THE BITPICKER'S TOOLBOX

By Steve MacGregor, 3701 W Wethersfield, Phoenix, Arizona 85029

To cause your Level II T-BUG to make a copy of itself, type the following "punch" command:

P 4380 497F 43C1 TBUG/ENTER

Before doing this, you may want to set up the register-eave area (in locations 4825-483C) to something. Mine has the SP and PC set to 4980, and all other registers set to zero.

To return to BASIC from T-BUG, one of the following will work:

J 0066 (to get to the READY state)
J 0000 (to get to the MEMORY SIZE? state)

If you don't enter a BASIC program, or otherwise do something that wipes out TBUG, you can re-enter it by typing "SYSTEM", and then "/17345".

Dear Gordon,

Enclosed you will find a listing of a program that I find helpful. It's a modification of one published in a recent issue of KILORAUD in an article by F. Reymers. Please note that my printer prints a bracket in place of the up arrow.

I am writing this letter using the ELECTRIC PENCIL and The TRS-232 interface unit sold by SMALL SYSTEMS SOFTWARE. The TRS-232 is bound to be the cheapest way to hook up a printer to the TRS-80. I am using an old Model 37 Teletype. Notice that it gives upper and lower case and allows for left and right justification. I'll bet the Teletype folks never had this application in mind. Old Teletypes are currently going for about \$500 which is about twice what they are worth. The interface costs \$39.95, I think. So for less than \$550 you can get into the printer business. That sure beats the Radio shack way.

Michael Shroyer's ELECTRIC PENCIL is pretty steep at \$100. Even so, it really is superb software. All hooked up you have a complete word processor which is probably the best non trivial use of a microprocessor that has been thought of so far.

While I am plugging other people's products (as a satisfied user) I might also mention that MICROCHESS by Peter Jennings is first class software. With all the junk for sale the good guys should get some credit.

Jamea B. Penny
1537 Ramada
Houston, Tx. 77062

```
5 CLEAR(100):CLS
10 PRINT "THIS PROGRAM CONVERTS THE INPUT NUMBER TO COMMON BASES"
20 PRINT "APPEND B, O, D, OR H TO THE NUMBER THAT YOU INPUT"
30 INPUT "ENTER THE NUMBER TO CONVERT (I.E. 123D)";NI$
40 IFRIGHT$(NI$,1)="B" THEN BI%=2:GOTO90
50 IFRIGHT$(NI$,1)="O" THEN BI%=8:GOTO90
60 IFRIGHT$(NI$,1)="D" THEN BI%=10:GOTO90
70 IFRIGHT$(NI$,1)="H" THEN BI%=16:GOTO90
80 PRINT "PLEASE USE THE INDICATED SUBSCRIPTS SO I KNOW WHAT YOU WANT"
85 GOTO30
90 PRINT "HEX";;"DECIMAL";;"OCTAL";;"BINARY"
100 LX=LEN(NI$):NI%=LEFT$(NI$,LX-1)
110 PRINT:BO%=16:GOSUB180:PRINTNO$;;
120 BO%=10:GOSUB180:PRINTNO$;;
130 BO%=8:GOSUB180:PRINTNO$;;
140 BO%=2:GOSUB180:PRINTTAB(46);NO$
150 INPUT "NEXT NUMBER TO BE CONVERTED";NI$:CLS:GOTO40
160 'BASE CONVERSION SUBROUTINE
170 'CONVERT TO DECIMAL
180 LX=LEN(NI$)
190 DEC=0
200 PWR%=0
210 FORJ=LX TO 1 STEP -1
220 K%=ASC(MID$(NI$,J,1))
230 IFK%>64 THEN K%=K%-7
240 K%=K%-48
250 IFK%<BI% AND K%>-1 THEN 300
260 PRINT "INVALID INPUT FOR BASE";
270 PRINTBI%
280 NO$="?????"
290 RETURN
300 DEC=DEC+INT(K%*BI%*(PWR%+.5))
310 PWR%=PWR%+1
320 NEXTJ
330 'CONVERT DECIMAL TO BASE #
340 H$="0123456789ABCDEF"
350 NO$=""
360 PWR%=LOG(DEC)/LOG(BO%)
370 FORJ=PWR% TO 0 STEP -1
380 XX=INT(BO%*(J+.5))
390 CH%=DEC/XX
400 NO$=NO$+MID$(H$,CH%+1,1)
410 DEC=DEC-CH%*XX+.5
420 NEXTJ
430 RETURN
440 END
```

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TRS-80*

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*TRS-80 is a product of Radio Shack, div. Tandy Corp.

MR. GORDON,

DECEMBER 26, 1978

YOU CAN USE THIS IN YOUR NEWSLETTER IF YOU WANT. EVERYBODY SAYS THE TRS-80 MONITOR IS NOT STABLE SO HERE IS SOMETHING YOU CAN DO ABOUT IT! I HAD A HORIZONTAL WIGGLE WHEN THE LIGHT DIMMER IN MY DINING ROOM WAS TURNED TO DIM! (FINDING THAT THE DIMMER WAS THE SOURCE OF THE PROBLEM IS ANOTHER STORY.) I CHANGED ALL POWER SUPPLY FILTER CAPACITORS IN THE MONITOR WITHOUT ANY SUCCESS. AFTER SOME WORK, MY FIX IS ADDING AN INDUCTOR IN SERIES WITH HOT SIDE OF THE AC LINE OF THE MONITOR. IT SEEMS TO BE 97% EFFECTIVE AT FIXING THE PROBLEM.

FOR THE INDUCTOR I USED CENTER TAP TO END WINDING OF A 12.6 VOLT @ 3 AMP FILMENT TRANSFORMER. (PRIMARY NOT USED.) NOTE: 2 TO 3 VOLTS OF LINE VOLTAGE ARE LOST USING THIS TRANSFORMER. I MOUNTED THE TRANSFORMER ON SIDE PANEL (NEAR HORIZ. TRANSFORMER) INSIDE THE MONITOR. THE ADDED INDUCTOR GIVES MUCH MORE NOISE & SPIKE SUPPRESSION TO THE MONITOR. A SOLA HARMONIC-NETURALIZED CONSTANT VOLTAGE TRANSFORMER (PART # 23-22-125) WILL PROVIDE NEAR 100% STABILITY FOR THE MONITOR (WITH OR WITHOUT MY FIX) BUT WOULD COST \$100 & UP.

I BUILT A TAPE CONTROL BOX WHICH I THINK IS BETTER. THEN CONTROL BOX INCLUDES THEN FOLLOWING.

1. SMALL VU METER TO USE TO SET TAPE VOLUME (VOLUME WILL VARY FROM TAPE RECORDER TO RECORDER)
2. CLOAD SWITCH (SWITCH TO COMPUTER, OFF, OR BUILD IN SPEAKER)
3. CSAVE SWITCH (SWITCH TO COMPUTER, OR OFF)
4. MOTOR CONTROL SWITCH (COMPUTER TO MOTOR *, OR MOTOR ON)
5. TRANSFER LIGHT (LED), ON = DATA TRANSFER

* WHEN USING THIS TAPE CONTROL BOX THE COMPUTER'S RELAY HAS A MAX OF 20 MILLS BECAUSE THE COMPUTER DRIVER ONLY THE BASE OF TIP146 TRANSISTOR BY A 9V BATT., 330 OHM RES, AND LED, ALL IN SERIES. THE COLLECTOR OF TIP146 CONTROLS THE TAPE RECORDER MOTOR. THE LOWER CURRENT THRU THE COMPUTER RELAY WILL GREATLY HELP RELAY FROM STICKING AND THE COMPUTER FROM NEEDING SERVICING.

SEND A DOLLAR AND I WILL SEND YOU A SCHEMATIC OF MY CONTROL BOX.

CONTACT ME IF YOU HAVE ANY QUESTIONS???

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THE BITPICKER'S TOOLBOX

By Steve MacGregor, 3701 W Wethersfield, Phoenix, Arizona 85029

To get your TRS-80 to return to the "MEMORY SIZE?" question, type "SYSTEM" in response to the prompt, and then "/0", rather than turning the power off and back on again. Besides being faster, since you should wait a few seconds between turning the power off and turning it on, this method has the virtue of leaving the RAM intact, except for the locations set up by the initialization process.

TRS-80 USERS GROUP - NEWSLETTER -
FEBRUARY 1979, VOLUME 2, NUMBER 2 - PAGE 12

DEAR GORDON,

HERE ARE A COUPLE OF ASSEMBLER PROGRAMS.

THE FIRST CALLED 'LIFE' STARTS AT 50 AND IS A VERSION OF CONWAY'S GAME OF LIFE USING A 64 X 16 BOARD. THE SECOND CALLED 'LIFE2' AT 100 IS ANOTHER VERSION OF LIFE USING A 128 X 40 BOARD AND SET AND POINT SUBROUTINES. THE FIRST RUNS ABOUT 1 GENERATION PER SECOND, THE SECOND ABOUT 20 SECONDS PER GENERATION.

THE THIRD PROGRAM STARTING AT 200 IS A LINE RENUMBERING PROGRAM CALLED 'RENUM'. THIS PROGRAM SEEMS TO NEED RESET BEING PRESSED A FEW TIMES AFTER THE RENUMBERING (DON'T KNOW WHY).

KEEP UP THE GOOD WORK.

YOURS SINCERELY

K. D. KOPPERT

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4500      00100      ORG      4500H
4C00      00110 IMAGE EQU      4C00H
3C00      00120 VIDEO EQU      3C00H
4020      00130 CURSOR EQU      4020H
4500 21003C 00140 LIFE LD HL,VIDEO;THIS VERSION LEVEL 2
4503 222040 00150 LD (CURSOR),HL
4506 010004 00160 LD BC,400H
4509 1E20 00170 LD E,20H
450B 21004C 00180 LD HL,IMAGE
450E 7B 00190 LP LD A,E ,SETS BOARD TO BLANKS
450F 77 00200 LD (HL),A
4510 23 00210 INC HL
4511 00 00220 DEC BC
4512 70 00230 LD A,0
4513 01 00240 OR C
4514 C20E45 00250 JP NZ,LP
4517 11003C 00260 LD DE,VIDEO;SETS SCREEN TO BLANK
451A 21004C 00270 LD HL,IMAGE
451D 010004 00280 LD BC,400H
4520 ED00 00290 LDIR
4522 219046 00300 LD HL,MSG1 ;DISPLAY OPENING MESSAGE
4525 067D 00310 LD 0,7DH
4527 7E 00320 LP1 LD A,(HL)
4520 CD3300 00330 CALL 33H
4520 23 00340 INC HL
452C 10F9 00350 DJNZ LP1
452E CD4B46 00360 CALL INPDEC
4531 329146 00370 LD (NOG),A
4534 211047 00380 LD HL,MSG2 ;DIPLAY MESSAGE 2
4537 0610 00390 LD 0,1BH
4539 7E 00400 LP2 LD A,(HL)
453A CD3300 00410 CALL 33H
453D 23 00420 INC HL
453E 10F9 00430 DJNZ LP2
4540 CD4046 00440 CALL INPDEC;INPUT NUMBER OF GENERATIONS
4543 329246 00450 LD (NUM),A
4546 213347 00460 LD HL,MSG3
4549 0614 00470 LD B,14H
4540 7E 00480 LP3 LD A,(HL) ,MESSAGE 3
454C CD3300 00490 CALL 33H
454F 23 00500 INC HL
4550 10F9 00510 DJNZ LP3
4552 3A9246 00520 INPOS LD A,(NUM);INPUT POSITIONS OF CELLS
4555 FE00 00530 CP 0H
4557 CA8145 00540 JP Z,DISPLY
455A 3D 00550 DEC A
455B 329246 00560 LD (NUM),A
455E CD4B46 00570 CALL INPDEC
4561 6F 00580 LD L,A

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4562 AF 00590 XOR A
4563 67 00600 LD H,A
4564 CD4B46 00610 CALL INPDEC
4567 329046 00620 LD (TEMP),A
456A FE00 00630 CP 0H
456C 280A 00640 JR Z,NOY
456E 3A9046 00650 LD A,(TEMP)
4571 47 00660 LD 0,A
4572 114000 00670 LD DE,40H
4575 19 00680 LPY ADD HL,DE
4576 10FD 00690 DJNZ LPY
4578 11004C 00700 NOV LD DE,IMAGE
457B 19 00710 ADD HL,DE
457C 362A 00720 LD (HL),2AH
457E C35245 00730 JP INPOS
4581 11003C 00740 DISPLY LD DE,VIDEO;TRANSFER CURRENT GENERATION TO
4584 21004C 00750 LD HL,IMAGE;TD SCREEN
4587 010004 00760 LD BC,400H
458A ED00 00770 LDIR
458C DD21003C 00780 LD IX,VIDEO;START SCAN FOR NEXT GENERATION
4590 FD21004C 00790 LD IY,IMAGE
4594 010004 00800 LD BC,400H
4597 AF 00810 NEXT XOR A
4598 329346 00820 LD (FIRST),A
4599 329446 00830 LD (FIRST+1),A
459E 329546 00840 LD (FIRST+2),A
45A1 329646 00850 LD (FIRST+3),A
45A4 329746 00860 LD (FIRST+4),A
45A7 329846 00870 LD (FIRST+5),A
45AA 329946 00880 LD (FIRST+6),A
45AD 329A46 00890 LD (FIRST+7),A
45B0 D07EC0 00900 STATE LD A,(IX+0C0H);FIND STATE OF SURROUNDING
45B3 329446 00910 LD (FIRST+1),A;CELLS
45B6 D07E40 00920 LD A,(IX+64)
45B9 329946 00930 LD (FIRST+6),A
45BC 79 00940 LD A,C
45BD E63F 00950 AND 3FH ;TEST FOR LEFT HAND SIDE
45BF FE00 00960 CP 0H
45C1 2812 00970 JR Z,RH
45C3 D07EBF 00980 LD A,(IX+0BFH)
45C6 329346 00990 LD (FIRST),A
45C9 D07EFF 01000 LD A,(IX+0FFH)
45CC 329646 01010 LD (FIRST+3),A
45CF D07E3F 01020 LD A,(IX+63)
45D2 329046 01030 LD (FIRST+5),A
45D5 79 01040 RH LD A,C
45D6 E63F 01050 AND 3FH ;TEST FOR RIGHT HAND SIDE
45D8 FE3F 01060 CP 3FH
45DA 2812 01070 JR Z,TEST
45DC D07EC1 01080 LD A,(IX+0C1H)
45DF 329546 01090 LD (FIRST+2),A
45E2 D07E01 01100 LD A,(IX+1)
45E5 329746 01110 LD (FIRST+4),A
45E8 D07E41 01120 LD A,(IX+65)
45EB 329A46 01130 LD (FIRST+7),A
45EE 70 01140 TEST LD A,0 ;TEST FOR LAST LINE
45EF FE00 01150 CP 0H
45F1 2015 01160 JR NZ,REM
45F3 79 01170 LD A,C
45F4 E680 01180 AND 80H

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45F6 2010 01190 JR NZ,REM
45F0 79 01200 LD A,C
45F9 D640 01210 SUB 40H
45FB F20846 01220 JP P,REM
45FE AF 01230 XOR A
45FF 329846 01240 LD (FIRST+5),A
4602 329946 01250 LD (FIRST+6),A
4605 329A46 01260 LD (FIRST+7),A
4608 D9 01270 REM EXX ;COUNT THE NUMBER OF NEIGHBOURS
4609 AF 01280 XOR A
460A 57 01290 LD D,A
460B 0608 01300 LD 0,0H
460D 219346 01310 LD HL,FIRST
4610 0E2A 01320 LD C,2AH
4612 79 01330 STEST LD A,C
4613 BE 01340 CP (HL)
4614 2001 01350 JR NZ,NINC
4616 14 01360 INC D
4617 23 01370 NINC INC HL
4618 10FB 01380 DJNZ STEST
461A 7A 01390 LD A,D
461B D9 01400 EXX
461C 57 01410 LD D,A ;IF NUMBER OF NEIGHBOURS IS 3
461D FE03 01420 CP 3H ;THEN CELL IS A BIRTH CELL
461F 2006 01430 JR NZ,NTEST
4621 FD36002A 01440 LD (IV),2AH
4625 1809 01450 JR ENOTES
4627 7A 01460 NTEST LD A,D ;IF NUMBER OF NEIGHBOURS IS 2
4628 FE02 01478 CP 2H ;CELL DOES NOT CHANGE
462A 2004 01480 JR Z,ENOTES
462C FD360020 01490 LD (IV),20H;SET TO BLANK IF NOT 2 OR 3
4630 D023 01500 ENOTES INC IX ;NEXT CELL
4632 FD23 01510 INC IY
4634 00 01520 DEC BC
4635 70 01530 LD A,B ;TEST IF ALL CELLS DONE
4636 01 01540 OR C
4637 C29745 01550 JP NZ,NEXT
463A 3A9146 01560 LD A,(NOG);TEST IF LAST GENERATION
463D 47 01570 LD B,A
463E FE00 01580 CP 0H
4640 CA0045 01590 JP Z,LIFE
4643 78 01600 LD A,B ;DECREMENT NUMBER OF GENERATIONS
4644 3D 01610 DEC A
4645 329146 01620 LD (NOG),A
4648 C3814* 01630 JP DISPLY
464B AF 01640 INPDEC XOR A ;SUBROUTINE TO INPUT A TWO DIGIT
464C 329346 01650 LD (FIRST),A;DECIMAL NUMBER. NOTE NO CHECK
464F 329446 01660 LD (FIRST+1),A;MADE TO SSEE IF DIGIT IS
4652 CD2B00 01670 SL1 CALL 2BH ;DECIMAL
4655 07 01680 OR A
4656 20FA 01690 JR Z,SL1
4658 CD3300 01700 CALL 33H
465B 5F 01710 LD E,A
465C E67F 01720 AND 7FH
465E FE00 01730 CP 00H
4660 CA7946 01740 JP Z,CONT
4663 78 01750 LD A,E
4664 E67F 01760 AND 7FH
4666 FE2C 01770 CP 2CH
4668 CA7946 01780 JP Z,CONT
466B 3A9446 01790 LD A,(FIRST+1)
466E 329346 01800 LD (FIRST),A
4671 78 01810 LD A,E
4672 D630 01820 SUB 20H

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4674 329446 01830 LD (FIRST+1),A
4677 10D9 01840 JR SL1
4679 3A9346 01850 CONT LD A,(FIRST)
467C FE00 01860 CP 0H
467E 280C 01878 JR Z,NFDIG
4680 3A9346 01880 LD A,(FIRST)
4683 47 01890 LD 0,A
4684 3A9446 01900 LD A,(FIRST+1)
4687 C60A 01910 SL2 ADD A,0AH
4689 10FC 01920 DJNZ SL2
468B C9 01930 RET
468C 3A9446 01940 NFDIG LD A,(FIRST+1)
468F C9 01950 RET
0001 01960 TEMP DEFS 1
0001 01978 NOG DEFS 1
0001 01980 NUM DEFS 1
000B 01990 FIRST DEFS 0
02000 MSG1 DEFB 'THIS IS A COMPUTER SIMULATION OF LIFE.'
02010 DEFB 00H
02020 DEFB 'INPUT THE NUMBER OF GENERATIONS AND'
02030 DEFB 'NUMBER IN FIRST GENERATION.'
02040 DEFB 00H
02050 DEFB 'NUMBER OF GENERATIONS?'
02060 MSG2 DEFB 'NUMBER IN FIRST GENERATION?'
02078 MSG3 DEFB 'INPUT POSITIONS A,B'
02080 DEFB 00H
02090 END LIFE

```

SL2	4687	STATE	4580	LP2	4539
NFDIG	468C	FIRST	4693	MSG2	4718
CONT	4679	NEXT	4597	NOG	4691
SL1	4652	LPY	4575	INPDEC	4648
ENOTES	4630	NOV	4578	LP1	4527
NTEST	4627	TEMP	4690	MSG1	4698
NINC	4617	DISPLY	4581	LP	450E
STEST	4612	INPOS	4552	LIFE	4500
REM	4608	LP3	4548	CURSOR	4020
TEST	45EE	MSG3	4733	VIDEO	3C00
RH	45D5	NUM	4692	IMAGE	4C00

```

A000: 21 00 3C 22 20 40 01 00 04 1E 20 21 00 4C 78 77
A010: 23 08 78 01 C2 0E A0 11 00 3C 21 00 4C 01 00 04
A020: ED B0 21 9B A1 06 7D 7E CD 33 00 23 10 F9 CD 40
A030: A1 32 91 A1 21 10 A2 06 10 7E CD 33 00 23 1B F9
A040: CD 40 A1 32 92 A1 21 33 A2 06 14 7E CD 33 00 23
A050: 10 F9 3A 92 A1 FE 00 CA 01 A0 3D 32 92 A1 CD 40
A060: A1 6F AF 67 CD 40 A1 32 90 A1 FE 00 20 0A 3A 90
A078: A1 47 11 40 00 19 10 FD 11 00 4C 19 36 2A C3 52
A080: A0 11 00 3C 21 00 4C 01 00 04 ED B0 D0 21 B0 3C
A090: FD 21 00 4C 01 00 04 AF 32 93 A1 32 94 A1 32 95
A0A0: A1 32 96 A1 32 97 A1 32 98 A1 32 99 A1 32 9A A1
A0B0: D0 7E C0 32 94 A1 D0 7E 40 32 99 A1 79 E6 3F FE
A0C0: 00 20 12 D0 7E BF 32 93 A1 D0 7E FF 32 96 A1 D0
A0D0: 7E 3F 32 98 A1 79 E6 3F FE 3F 20 12 D0 7E C1 32
A0E0: 95 A1 D0 7E 01 32 97 A1 D0 7E 41 32 9A A1 78 FE
A0F0: 00 20 15 79 E6 80 20 10 79 D6 40 F2 00 A1 AF 32
A100: 98 A1 32 99 A1 32 9A A1 D9 AF 57 06 08 21 93 A1
A110: 0E 2A 79 BE 20 01 14 23 10 F0 7A D9 57 FE C3 20
A120: 06 FD 36 00 2A 10 09 7A FE 02 20 04 FD 36 00 20
A130: D0 23 FD 23 00 78 01 C2 97 A0 3A 91 A1 47 FE 00

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R140: CA 00 A0 70 3D 32 91 A1 C3 81 A0 AF 32 93 A1 32
R150: 94 A1 CD 2B 00 07 28 FA CD 33 00 5F E6 7F FE 00
R160: CA 79 A1 7B E6 7F FE 2C CA 79 A1 3A 94 A1 32 93
R170: A1 78 D6 30 32 94 A1 10 D9 3A 93 A1 FE 00 20 0C
R180: 3A 93 A1 47 3A 94 A1 C6 0A 10 FC C9 3A 94 A1 C9
R190: C2 CA D8 D8 D8 D8 D8 D8 D8 D8 54 48 49 53 20
R1A0: 49 53 20 41 20 43 4F 4D 50 55 54 45 52 20 53 49
R1B0: 4D 55 4C 41 54 49 4F 4E 20 4F 46 20 4C 49 46 45
R1C0: 2E 00 49 4E 50 55 54 20 54 48 45 20 4E 55 4D 42
R1D0: 45 52 20 4F 46 20 47 45 4E 45 52 41 54 49 4F 4E
R1E0: 53 20 41 4E 44 20 4E 55 4D 42 45 52 20 49 4E 20
R1F0: 46 49 52 53 54 20 47 45 4E 45 52 41 54 49 4F 4E
R200: 2E 00 4E 55 4D 42 45 52 20 4F 46 20 47 45 4E 45
R210: 52 41 54 49 4F 4E 53 3F 4E 55 4D 42 45 52 20 49
R220: 4E 20 46 49 52 53 54 20 47 45 4E 45 52 41 54 49
R230: 4F 4E 3F 49 4E 50 55 54 20 50 4F 53 49 54 49 4F
R248: 4E 53 20 41 2C 42 00

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4500 00100 ORG 4500H
4C00 00110 IMAGE EQU 4C00H
3C00 00120 VIDEO EQU 3C00H
4020 00130 CURSOR EQU 4020H
4500 21003C 00140 LIFE LD HL, VIDEO
4503 222040 00150 LD (CURSOR), HL
4506 3E0E 00160 LD A, 0EH
4508 CD3300 00170 CALL 33H
4508 010004 00180 LD BC, 400H
450E 1E00 00190 LD E, 00H
4510 21004C 00200 LD HL, IMAGE
4513 78 00210 LP LD A, E
4514 77 00220 LD (HL), A
4515 23 00230 INC HL
4516 08 00240 DEC 8C
4517 78 00250 LD A, 0
4518 01 00260 OR C
4519 C21345 00270 JP NZ, LP
451C 11003C 00280 LD DE, VIDEO
451F 21004C 00290 LD HL, IMAGE
4522 010004 00300 LD BC, 400H
4525 ED00 00310 LDIR
4527 21EF46 00320 LD HL, MSG1, DISPLAY OPENING MESSAGE
452A 067D 00330 LD 8, 7DH
452C 7E 00340 LP1 LD A, (HL)
452D CD3300 00350 CALL 33H
4530 23 00360 INC HL
4531 10F9 00370 DJNZ LP1
4533 CDA246 00380 CALL INPDEC
4536 32E846 00390 LD (NOG), A
4539 216C47 00400 LD HL, MSG2; DISPLAY MESSAGE 2
453C 0618 00410 LD 0, 18H
453E 7E 00420 LP2 LD A, (HL)
453F CD3300 00430 CALL 33H
4542 23 00440 INC HL
4543 10F9 00450 DJNZ LP2
4545 CDA246 00460 CALL INPDEC
4548 32E946 00470 LD (NUM), A
454B 210747 00480 LD HL, MSG3
454E 0614 00490 LD 0, 14H
4550 7E 00500 LP3 LD A, (HL)
4551 CD3300 00510 CALL 33H
4554 23 00520 INC HL
4555 10F9 00530 DJNZ LP3
4557 3AE946 00540 INPOS LD A, (NUM)
455A FE00 00550 CP 0H
455C CA7845 00560 JP Z, DISPLY

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455F 3D 00570 DEC A
4560 32E946 00580 LD (NUM), A
4563 CDA246 00590 CALL INPDEC
4566 326048 00600 LD (X), A
4569 CDA246 00610 CALL INPDEC
456C 326148 00620 LD (Y), A
456F CD9B47 00630 CALL PIXEL
4572 CDE147 00640 CALL SET
4575 C35745 00650 JP INPOS
4578 11003C 00660 DISPLY LD DE, VIDEO
457B 21004C 00670 LD HL, IMAGE
457E 010004 00680 LD BC, 400H
4581 ED00 00690 LDIR
4583 21004C 00700 LD HL, IMAGE
4586 010004 00710 LD BC, 400H
4589 3E00 00720 CLS LD A, 00H
458B 77 00730 LD (HL), A
458C 23 00740 INC HL
458D 00 00750 DEC BC
458E 70 00760 LD A, 0
458F 01 00770 OR C
4590 20F7 00780 JR NZ, CLS
4592 3E01 00790 LD A, 1
4594 32ED46 00800 LD (KOUNTY), A
4597 3E01 00810 YLOOP LD A, 1
4599 32EC46 00820 LD (KOUNTX), A
459C 3AEC46 00830 XLOOP LD A, (KOUNTX)
459F 3D 00840 DEC A
45A0 326048 00850 LD (X), A
45A3 3AED46 00860 LD A, (KOUNTY)
45A6 3D 00870 DEC A
45A7 326148 00880 LD (Y), A
45AA CD9B47 00890 CALL PIXEL
45AD CD2148 00900 CALL POINT
45B0 32EE46 00910 LD (NEIGHD), A
45B3 3A6048 00920 LD A, (X)
45B6 3C 00930 INC A
45B7 326048 00940 LD (X), A
45BA CD9B47 00950 CALL PIXEL
45BD CD2148 00960 CALL POINT
45C0 DD21EE46 00970 LD IX, NEIGHD
45C4 DD8600 00980 ADD A, (IX)
45C7 32EE46 00990 LD (NEIGHD), A
45CA 3A6048 01000 LD A, (X)
45CD 3C 01010 INC A
45CE 326048 01020 LD (X), A
45D1 CD9B47 01030 CALL PIXEL
45D4 CD2148 01040 CALL POINT
45D7 DD8600 01050 ADD A, (IX)
45DA 32EE46 01060 LD (NEIGHD), A
45DD 3A6048 01070 LD A, (X)
45E0 3D 01080 DEC A
45E1 3D 01090 DEC A
45E2 326048 01100 LD (X), A
45E5 3A6148 01110 LD A, (Y)
45E8 3C 01120 INC A
45E9 326148 01130 LD (Y), A
45EC CD9B47 01140 CALL PIXEL
45EF CD2148 01150 CALL POINT
45F2 DD8600 01160 ADD A, (IX)

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45F5 32EE46	01170	LD	(NEIGHD), A	4697 CA0045	01010	JP	Z, LIFE	4780 326448	02440	NOCARY	LD	(XCOMP), A
45F0 3A6040	01180	LD	A, (X)	469A 78	01020	LD	A, 0	4783 1600	02450		LD	D, 0
45F0 3C	01190	INC	A	469B 3D	01030	DEC	A	47B5 3A6148	02460		LD	A, (Y)
45FC 3C	01200	INC	A	469C 32EB46	01040	LD	(NOG), A	4700 D603	02470	DIV3	SUB	3
45FD 326040	01210	LD	(X), A	469F C37B45	01050	JP	DISPLY	47BA FAC047	02480		JP	M, REINC
4600 CD9B47	01220	CALL	PIXEL	46A2 AF	01060	INPDEC	XOR	47B0 14	02490		INC	D
4603 CD2148	01230	CALL	POINT	46A3 32EA46	01070	LD	(FIRST), A	47BE 18F8	02500		JR	DIV3
4606 D08600	01240	ADD	A, (IX)	46A6 32EB46	01080	LD	(FIRST+1), A	47C0 C603	02510	REINC	ADD	A, 3
4609 32EE46	01250	LD	(NEIGHD), A	46A9 CD2B00	01090	SL1	CALL	47C2 326348	02520		LD	(YREM), A
460C 3A6048	01260	LD	A, (X)	46AC 87	01900	OR	A	47C5 7A	02530		LD	A, D
460F 3D	01270	DEC	A	46AD 28FA	01910	JR	Z, SL1	47C6 326548	02540		LD	(YCOMP), A
4610 3D	01280	DEC	A	46AF CD3300	01920	CALL	33H	47C9 2600	02550		LD	H, 0
4611 326040	01290	LD	(X), A	46B2 5F	01930	LD	E, A	47CB 3A6540	02560		LD	A, (YCOMP)
4614 3A6148	01300	LD	A, (Y)	46B3 E67F	01940	AND	7FH	47CE 6F	02570		LD	L, A
4617 3C	01310	INC	A	46B5 FE0D	01950	CP	0DH	47CF 29	02580		ADD	HL, HL
4610 326148	01320	LD	(Y), A	46B7 CAD046	01960	JP	Z, CONT	47D0 29	02590		ADD	HL, HL
461B CD9B47	01330	CALL	PIXEL	46BA 7B	01970	LD	A, E	47D1 29	02600		ADD	HL, HL
461E CD2148	01340	CALL	POINT	46BB E67F	01980	AND	7FH	47D2 29	02610		ADD	HL, HL
4621 D08600	01350	ADD	A, (IX)	46BD FE2C	01990	CP	2CH	47D3 29	02620		ADD	HL, HL
4624 32EE46	01360	LD	(NEIGHD), A	46BF CAD046	02000	JP	Z, CONT	47D4 29	02630		ADD	HL, HL
4627 3A6040	01370	LD	A, (X)	46C2 3AEB46	02010	LD	A, (FIRST+1)	47D5 11003C	02640		LD	DE, VIDEO
462A 3C	01380	INC	A	46C5 32EA46	02020	LD	(FIRST), A	47D8 19	02650		ADD	HL, DE
462B 326040	01390	LD	(X), A	46C8 70	02030	LD	A, E	47D9 1600	02660		LD	D, 0
462E CD9B47	01400	CALL	PIXEL	46C9 D630	02040	SUB	30H	47DB 3A6448	02670		LD	A, (XCOMP)
4631 CD2148	01410	CALL	POINT	46CB 32EB46	02050	LD	(FIRST+1), A	47DE 5F	02680		LD	E, A
4634 D08600	01420	ADD	A, (IX)	46CE 1809	02060	JR	SL1	47DF 19	02690		ADD	HL, DE
4637 32EE46	01430	LD	(NEIGHD), A	46D0 3AER46	02070	LD	A, (FIRST)	47E0 C9	02700		RET	
463A 3A6048	01440	LD	A, (X)	46D3 FE00	02080	CP	0H	47E1 1E00	02710	SET	LD	E, 0
463D 3C	01450	INC	A	46D5 280C	02090	JR	Z, NFDIG	47E3 1610	02720		LD	D, 10H
463E 326048	01460	LD	(X), A	46D7 3AER46	02100	LD	A, (FIRST)	47E5 19	02730		ADD	HL, DE
4641 CD9B47	01470	CALL	PIXEL	46DA 47	02110	LD	0, A	47E6 3A6340	02740		LD	A, (YREM)
4644 CD2148	01480	CALL	POINT	46DB 3AEB46	02120	LD	A, (FIRST+1)	47E9 FE00	02750		CP	0
4647 D08600	01490	ADD	A, (IX)	46DE C60A	02130	SL2	ADD	47EB 2808	02760		JR	Z, YZERO
464A 32EE46	01500	LD	(NEIGHD), A	46E0 10FC	02140	DJNZ	A, 0AH	47ED FE01	02770		CP	1
464D 3AEC46	01510	LD	A, (KOUNTX)	46E2 C9	02150	RET		47EF 2013	02780		JR	Z, YONE
4650 326048	01520	LD	(X), A	46E3 3AEB46	02160	NFDIG	LD	47F1 FE02	02790		CP	2
4653 3AED46	01530	LD	A, (KOUNTY)	46E6 C9	02170	RET	A, (FIRST+1)	47F3 201E	02800		JR	Z, YTWO
4656 326148	01540	LD	(Y), A	0001	02180	TEMP	DEFS	47F5 3A6240	02810	VZERO	LD	A, (XREM)
4659 3AEE46	01550	LD	A, (NEIGHD)	0001	02190	NOG	DEFS	47F8 FE00	02820		CP	0
465C FE03	01560	CP	3	0001	02200	NUM	DEFS	47FA 2004	02830		JR	NZ, Y0X1
465E 2008	01570	JR	NZ, NOBIRF	0002	02210	FIRST	DEFS	47FC CBC6	02840		SET	0, (HL)
4660 CD9B47	01580	CALL	PIXEL	0001	02220	KOUNTX	DEFS	47FE 1020	02850		JR	SUBEND
4663 CDE147	01590	CALL	SET	0001	02230	KOUNTY	DEFS	4800 CBCE	02860	Y0X1	SET	1, (HL)
4666 1811	01600	JR	ENDXLP	0001	02240	NEIGHD	DEFS	4802 181C	02870		JR	SUBEND
4660 FE02	01610	CP	2	02250	MSG1	DEFM	'THIS IS A COMPUTER SIMULATION OF LIFE.'	4804 3A6248	02880	YONE	LD	A, (XREM)
466A 200D	01620	JR	NZ, ENDXLP	02260		DEFB	0DH	4807 FE00	02890		CP	0
466C CD9B47	01630	CALL	PIXEL	02270		DEFB	'INPUT THE NUMBER OF GENERATIONS AND'	4809 2004	02900		JR	NZ, Y1X1
466F CD2148	01640	CALL	POINT	02280		DEFB	'NUMBER IN FIRST GENERATION.'	480B CBD6	02910		SET	2, (HL)
4672 FE01	01650	CP	1	02290		DEFB	0DH	480D 1011	02920		JR	SUBEND
4674 2003	01660	JR	NZ, ENDXLP	02300		DEFB	'NUMBER OF GENERATIONS?'	480F CBDE	02930	Y1X1	SET	3, (HL)
4676 CDE147	01670	CALL	SET	02310	MSG2	DEFM	'NUMBER IN FIRST GENERATION?'	4811 1800	02940		JR	SUBEND
4679 3AEC46	01680	LD	A, (KOUNTX)	02320	MSG3	DEFM	'INPUT POSITIONS A, 0'	4813 3A6240	02950	YTWO	LD	A, (XREM)
467C 3C	01690	INC	A	02330		DEFB	0DH	4816 FE00	02960		CP	0
467D 32EC46	01700	LD	(KOUNTX), A	4798 AF	02340	PIXEL	XOR	4818 2004	02970		JR	NZ, Y2X1
4680 FE7F	01710	CP	127	479C 326248	02350		LD	481A CBE6	02980		SET	4, (HL)
4682 C29C45	01720	JP	NZ, XLOOP	479F 326348	02360		LD	481C 1802	02990		JR	SUBEND
4685 3AED46	01730	LD	A, (KOUNTY)	47A2 3A6048	02370		LD	481E CBEE	03000	Y2X1	SET	5, (HL)
4688 3C	01740	INC	A	47A5 C03F	02380		SRL	4820 C9	03010	SUBEND	RET	
4689 32ED46	01750	LD	(KOUNTY), A	47A7 3007	02390		JR	4821 3A6348	03020	POINT	LD	A, (YREM)
468C FE2F	01760	CP	47	47A9 57	02400		LD	4824 FE00	03030		CP	0
468E C29745	01770	JP	NZ, YLOOP	47AA 3E81	02410		LD	4826 2806	03040		JR	Z, YZEROP
4691 3AEB46	01780	LD	A, (NOG)	47AC 326248	02420		LD					
4694 47	01790	LD	0, A	47AF 7A	02430		LD					
4695 FE00	01800	CP	0H									

4828	FE01	03050	CP	1			
482A	2811	03060	JR	Z, YONEP	PNTONE	4850	ENDXLP 4679
482C	181E	03070	JR	YTHOP	Y2X1P	4857	NO8IRF 4668
482E	3A6248	03080	LD	A, (XREM)	V1X1P	4848	NEIGHD 46EE
4831	FE00	03090	CP	0	PNTEND	4859	POINT 4821
4833	2004	03100	JR	NZ, Y0X1P	Y0X1P	4839	XLDOP 459C
4835	CB46	03110	BIT	0, (HL)	YTHOP	484C	KDUNT 46EC
4837	1820	03120	JR	PNTEND	YONEP	4830	YLOOP 4597
4839	CB4E	03130	BIT	1, (HL)	YZEROP	482E	KOUNTY 46ED
4830	181C	03140	JR	PNTEND	Y2X1	481E	CLS 4589
4830	3A6248	03150	LD	A, (XREM)	V1X1	480F	SET 47E1
4840	FE00	03160	CP	0	SUBEND	4820	PIXEL 4798
4842	2004	03170	JR	NZ, Y1X1P	Y0X1	4800	Y 4861
4844	CB56	03180	BIT	2, (HL)	YTHO	4813	X 4860
4846	1811	03190	JR	PNTEND	YONE	4804	DISPLY 4578
4848	CB5E	03200	BIT	3, (HL)	YZERO	47F5	INPOS 4557
484A	1800	03210	JR	PNTEND	YCOMP	4865	LP3 4550
484C	3A6248	03220	LD	A, (XREM)	REINC	47C0	MSG3 4787
484F	FE00	03230	CP	0	DIV3	4788	NUM 46E9
4851	2004	03240	JR	NZ, Y2X1P	XCOMP	4864	LP2 453E
4853	CB66	03250	BIT	4, (HL)	NOARRY	4780	MSG2 476C
4855	1802	03260	JR	PNTEND	YREM	4863	NOG 46E0
4857	CB6E	03278	BIT	5, (HL)	XREM	4862	INPDEC 46A2
4859	2002	03280	JR	PNTEND	TEMP	46E7	LP1 452C
485B	AF	03290	XOR	A	SL2	46DE	MSG1 46EF
485C	C9	03300	RET		NFDIG	46E3	LP 4513
485D	3E01	03310	LD	A, 1	CONT	46D0	LIFE 4500
485F	C9	03320	RET		SL1	46A9	CURSOR 4820
0001		03330	DEFS	1	FIRST	46EA	VIDED 3C00
0001		03340	DEFS	1	ENDVLP	4685	IMAGE 4C00
0001		03350	DEFS	1			
0001		03360	DEFS	1			
0001		03370	DEFS	1			
0001		03380	DEFS	1			
4500		03390	END	LIFE			

00000 TOTAL ERRORS

A000:	21	00	3C	22	20	40	3E	0E	CD	33	00	01	00	04	1E	00
A010:	21	00	4C	7B	77	23	06	78	81	C2	13	A0	11	00	3C	21
A020:	00	4C	01	00	04	ED	00	21	EF	A1	06	7D	7E	CD	33	00
A030:	23	10	F9	CD	A2	A1	32	E0	A1	21	6C	A2	06	10	7E	CD
A040:	33	00	23	10	F9	CD	A2	A1	32	E9	A1	21	87	A2	06	14
A050:	7E	CD	33	00	23	10	F9	3A	E9	A1	FE	00	CA	78	A0	3D
A060:	32	E9	A1	CD	A2	A1	32	60	A3	CD	A2	A1	32	61	A3	CD
A070:	9B	A2	CD	E1	A2	C3	57	A0	11	00	3C	21	00	4C	01	00
A080:	04	ED	00	21	00	4C	01	00	04	3E	00	77	23	08	78	81
A090:	20	F7	3E	01	32	ED	A1	3E	01	32	EC	A1	3A	EC	A1	3D
A0A0:	32	60	A3	3A	ED	A1	3D	32	61	A3	CD	9B	A2	CD	21	A3
A0B0:	32	EE	A1	3A	60	A3	3C	32	60	A3	CD	9B	A2	CD	21	A3
A0C0:	DD	21	EE	A1	DD	86	00	32	EE	A1	3A	60	A3	3C	32	60
A0D0:	A3	CD	9B	A2	CD	21	A3	DD	86	00	32	EE	A1	3A	60	A3
A0E0:	3D	3D	32	60	A3	3A	61	A3	3C	32	61	A3	CD	9B	A2	CD
A0F0:	21	A3	DD	86	00	32	EE	A1	3A	60	A3	3C	3C	32	60	A3
A100:	CD	9B	A2	CD	21	A3	DD	86	00	32	EE	A1	3A	60	A3	3D
A110:	3D	32	60	A3	3A	61	A3	3C	32	61	A3	CD	9B	A2	CD	21
A120:	A3	DD	86	00	32	EE	A1	3A	60	A3	3C	32	60	A3	CD	9B
A130:	A2	CD	21	A3	DD	86	00	32	EE	A1	3A	60	A3	3C	32	60
A140:	A3	CD	9B	A2	CD	21	A3	DD	86	00	32	EE	A1	3A	EC	A1
A150:	32	60	A3	3A	ED	A1	32	61	A3	3A	EE	A1	FE	03	20	08
A160:	CD	9B	A2	CD	E1	A2	10	11	FE	02	20	0D	CD	9B	A2	CD
A170:	21	A3	FE	01	20	03	CD	E1	A2	3A	EC	A1	3C	32	EC	A1
A180:	FE	7F	C2	9C	A0	3A	ED	A1	3C	32	ED	A1	FE	2F	C2	97
A190:	A0	3A	E0	A1	47	FE	00	CA	00	A0	7B	3D	32	E0	A1	C3
A1A0:	78	A0	AF	32	EA	A1	32	E8	A1	CD	20	00	07	20	FA	CD
A1B0:	33	00	5F	E6	7F	FE	00	CA	DD	A1	7B	E6	7F	FE	2C	CA

A1C0:	D0	A1	3A	E0	A1	32	EA	A1	7B	D6	30	32	E0	A1	18	D9
A1D0:	3A	EA	A1	FE	00	20	0C	3A	EA	A1	47	3A	EB	A1	C6	0A
A1E0:	10	FC	C9	3A	E0	A1	C9	55	00	00	00	00	7F	2F	00	54
A1F0:	48	49	53	20	49	53	20	41	20	43	4F	40	50	55	54	45
A200:	52	20	53	49	4D	55	4C	41	54	49	4F	4E	20	4F	46	20
A210:	4C	49	46	45	2E	00	49	4E	50	55	54	20	54	48	45	20
A220:	4E	55	4D	42	45	52	20	4F	46	20	47	45	4E	45	52	41
A230:	54	49	4F	4E	53	20	41	4E	44	20	4E	55	40	42	45	52
A240:	20	49	4E	20	46	49	52	53	54	20	47	45	4E	45	52	41
A250:	54	49	4F	4E	2E	00	4E	55	40	42	45	52	20	4F	46	20
A260:	47	45	4E	45	52	41	54	49	4F	4E	53	3F	4E	55	40	42
A270:	45	52	20	49	4E	20	46	49	52	53	54	20	47	45	4E	45
A280:	52	41	54	49	4F	4E	3F	49	4E	50	55	54	20	50	4F	53
A290:	49	54	49	4F	4E	53	20	41	2C	42	00	AF	32	62	A3	32
A2A0:	63	A3	3A	60	A3	CB	3F	30	07	57	3E	01	32	62	A3	7A
A2B0:	32	64	A3	16	00	3A	61	A3	D6	03	FA	C0	A2	14	10	F0
A2C0:	06	03	32	63	A3	7A	32	65	A3	26	00	3A	65	A3	6F	29
A2D0:	29	29	29	29	29	11	00	3C	19	16	00	3A	64	A3	5F	19
A2E0:	C9	1E	00	16	10	19	3A	63	A3	FE	00	20	00	FE	01	20
A2F0:	13	FE	02	20	1E	3A	62	A3	FE	00	20	04	CB	C6	10	20
A300:	CB	CE	10	1C	3A	62	A3	FE	00	20	04	C0	D6	10	11	CB
A310:	DE	18	00	3A	62	A3	FE	00	20	04	CB	E6	10	02	CB	EE
A320:	C9	3A	63	A3	FE	00	20	06	FE	01	20	11	10	1E	3A	62
A330:	A3	FE	00	20	04	CB	46	18	20	CB	4E	10	1C	3A	62	A3
A340:	FE	00	20	04	C8	56	10	11	C0	5E	18	00	3A	62	A3	FE
A350:	00	20	04	C8	66	10	02	C0	6E	20	02	AF	C9	3E	01	C9

00010 ; LINE RENUMBERING PROGRAM.

00020 ; LEVEL2 LINES HAVE THE FORMAT

00030 ; ADDRESS OF NEXT LINE, LINE NUMBER, STATEMENT, 0.

00040 ; FIRST LINE STARTS AT 42E9H

00050 ;

00060 ;

7D00	00100	ORG	32000
7D00	21607D	LD	HL, MSG1
7D03	CDCD7D	CALL	MSGOUT
7D06	CDD97D	CALL	INPNUM
7D09	22C07D	LD	(NLINE), HL ; NEW FIRST LINE NO.
7D0C	21867D	LD	HL, MSG2
7D0F	CDCD7D	CALL	MSGOUT
7D12	CDD97D	CALL	INPNUM
7D15	22C27D	LD	(LINC), HL ; NEW LINE INCREMENT
7D10	21A17D	LD	HL, MSG3
7D1B	CDCD7D	CALL	MSGOUT
7D1E	CDD97D	CALL	INPNUM
7D21	22C47D	LD	(LLNUM), HL ; OLD LAST LINE NUMBER
7D24	21E942	LD	HL, 42E9H
7D27	22C67D	LD	(NEXTL), HL ; ADDRESS OF NEXT LINE
7D2A	DD2AC67D	LD	IX, (NEXTL)
7D2E	DD6601	LD	H, (IX+1)
7D31	DD6E00	LD	L, (IX)
7D34	22C67D	LD	(NEXTL), HL
7D37	DD6603	LD	H, (IX+3)
7D3A	DD6E02	LD	L, (IX+2)
7D3D	22BE7D	LD	(TEMP), HL
7D40	2AC07D	LD	HL, (NLINE)
7D43	DD7403	LD	(IX+3), H
7D46	DD7502	LD	(IX+2), L
7D49	ED4BC27D	LD	BC, (LINC)
7D4D	09	ADD	HL, BC

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7D4E 22C07D 00370 LD (NL),NL
7D51 D021C47D 00380 LD IX,LLNUM
7D55 3ABE7D 00390 LD A,(TEMP)
7D58 D0BE00 00400 CP (IX)
7D5B 20CD 00410 JR NZ,BGNRNM
7D5D 3ABF7D 00420 LD A,(TEMP+1)
7D60 D0BE01 00430 CP (IX+1)
7D63 20C5 00440 JR NZ,BGNRNM
7D65 C3191A 00450 JP 1A19H

00460 MSG1 DEFM 'INPUT NEW FIRST LINE NUMBER? 0'
00470 MSG2 DEFM 'INPUT NEW LINE INCREMENT? 0'
00480 MSG3 DEFM 'INPUT OLD LAST LINE NUMBER? 0'
00490 TEMP DEFS 2

0002 00500 NLINE DEFS 2
0002 00510 LINC DEFS 2
0002 00520 LLNUM DEFS 2
0002 00530 NEXTL DEFS 2
0005 00540 NUMBER DEFS 5
7DCD 7E 00550 MSGOUT LD A,(NL) ;SUBROUTINE TO DISPLAY MESSAGE
7DCE FE30 00560 CP 30H
7DD0 2006 00570 JR Z,EMSG
7DD2 CD3300 00580 CALL 33H
7DD5 23 00590 INC HL
7DD6 18F5 00600 JR MSGOUT
7DD8 C9 00610 EMSG RET
7DD9 AF 00620 INPNUM XOR A ;SUBROUTINE TO INPUT A 5 DIGIT
7DDA 32C87D 00630 LD (NUMBER),A ;DECIMAL NUMBER
7DD0 32C97D 00640 LD (NUMBER+1),A
7DE0 32CA7D 00650 LD (NUMBER+2),A
7DE3 32CB7D 00660 LD (NUMBER+3),A
7DE6 32CC7D 00670 LD (NUMBER+4),A
7DE9 CD2B00 00680 LP1 CALL 2BH
7DEC B7 00690 OR A
7DED 28FA 00700 JR Z,LP1
7DEF FE00 00710 CP 0DH
7DF1 282C 00720 JR Z,REST
7DF3 CD3300 00730 CALL 33H
7DF6 D630 00740 SUB 30H
7DF8 32BE7D 00750 LD (TEMP),A
7DFB D021C87D 00760 LD IX,NUMBER
7DFF D07E03 00770 LD A,(IX+3)
7E02 D07704 00780 LD (IX+4),A
7E05 D07E02 00790 LD A,(IX+2)
7E08 D07703 00800 LD (IX+3),A
7E0B D07E01 00810 LD A,(IX+1)
7E0E D07702 00820 LD (IX+2),A
7E11 D07E00 00830 LD A,(IX)
7E14 D07701 00840 LD (IX+1),A
7E17 3ABE7D 00850 LD A,(TEMP)
7E1A D07700 00860 LD (IX),A
7E1D 18CA 00870 JR LP1
7E1F 3ACB7D 00880 REST LD A,(NUMBER)
7E22 6F 00890 LD L,A
7E23 AF 00900 XOR A
7E24 67 00910 LD H,A
7E25 3AC97D 00920 LD A,(NUMBER+1)
7E28 FE00 00930 CP 0
7E2A 2807 00940 JR Z,NN1
7E2C 47 00950 LD 0,A
7E2D 110A00 00960 LD DE,10
7E30 19 00970 INL1 ADD HL,DE
7E31 10FD 00980 DJNZ INL1
7E33 3ACA7D 00990 NN1 LD A,(NUMBER+2)
7E36 FE00 01000 CP 0

```

```

7E38 2807 01010 JR Z,NN2
7E3A 47 01020 LD 0,A
7E3B 116400 01030 LD DE,100
7E3E 19 01040 INL2 ADD HL,DE
7E3F 10FD 01050 DJNZ INL2
7E41 3ACB7D 01060 NN2 LD A,(NUMBER+3)
7E44 FE00 01070 CP 0
7E46 2807 01080 JR Z,NN3
7E48 47 01090 LD 0,A
7E49 11E803 01100 LD DE,1000
7E4C 19 01110 INL3 ADD NL,DE
7E4D 10FD 01120 DJNZ INL3
7E4F 3ACC7D 01130 NN3 LD A,(NUMBER+4)
7E52 FE00 01140 CP 0
7E54 2807 01150 JR Z,FINIS
7E56 47 01160 LD 0,A
7E57 111827 01170 LD DE,10000
7E5A 19 01180 INL4 ADD HL,DE
7E5B 10FD 01190 DJNZ INL4
7E5D 3E00 01200 FINIS LD A,0DH
7E5F CD3300 01210 CALL 33H
7E62 C9 01220 RET
7D00 01230 END RENUM

00000 TOTAL ERRORS

```

```

A000: 21 60 A0 CD CD A0 CD D9 A0 22 C8 A0 21 86 A0 CD
A010: CD A0 CD D9 A0 22 C2 A0 21 A1 A0 CD CD A0 CD D9
A020: A0 22 C4 A0 21 E9 42 22 C6 A0 DD 2A C6 A0 DD 66
A030: 01 D0 6E 00 22 C6 A0 DD 66 03 D0 6E 02 22 BE A0
A040: 2A C8 A0 DD 74 03 D0 75 02 ED 40 C2 A0 09 22 C0
A050: A0 DD 21 C4 A0 3A BE A0 DD BE 00 20 CD 3A BF A0
A060: DD BE 01 20 C5 C3 19 1A 49 4E 50 55 54 20 4E 45
A070: 57 20 46 49 52 53 54 20 4C 49 4E 45 28 4E 55 4D
A080: 42 45 52 3F 28 30 49 4E 50 55 54 28 4E 45 57 28
A090: 4C 49 4E 45 28 49 4E 43 52 45 4D 45 4E 54 3F 28
A0A0: 30 49 4E 50 55 54 20 4F 4C 44 20 4C 41 53 54 20
A0B0: 4C 49 4E 45 28 4E 55 4D 42 45 52 3F 28 30 21 A3
A0C0: DD 21 EE A1 DD 06 00 32 EE A1 3A 60 A3 7E FE 30
A0D0: 20 06 CD 33 00 23 10 F5 C9 AF 32 C8 A0 32 C9 A0
A0E0: 32 CA A0 32 C8 A0 32 CC A0 CD 28 00 07 28 FA FE
A0F0: 00 28 2C CD 33 00 D6 30 32 BE A0 DD 21 C8 A0 DD
A100: 7E 03 D0 77 04 D0 7E 02 D0 77 03 D0 7E 01 D0 77
A110: 02 D0 7E 00 D0 77 01 3A BE A0 DD 77 00 10 CA 3A
A120: C8 A0 6F AF 67 3A C9 A0 FE 00 28 07 47 11 0A 00
A130: 19 10 FD 3A CA A0 FE 00 28 07 47 11 64 00 19 10
A140: FD 3A C8 A0 FE 00 28 07 47 11 E8 03 19 10 FD 3A
A150: CC A0 FE 00 28 07 47 11 10 27 19 10 FD 3E 00 CD
A160: 33 00 C9

```

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In the last year I have gained a lot of knowledge about interfacing the TRS-80 to the outside world and would like to share that experience with your readers. Please have interested personnel send a self addressed stamped envelope to me for information.

I have developed an in-expensive I/O interface module for operating and controlling motors, relays, lights, etc. It will accept 4 inputs (arranged in BCD format for 16 combinations) and up to 16 independent outputs. The unit is complete with self contained power supply and interface cable. For Level II only (does not require expansion interface) The price including shipping is \$35.00 in kit form, or \$50.00 completely wired and tested. Write for details or send Check or Money Order. Quantities limited.

I also have a schematic for building an in-expensive (cheap) sound interface. Send SASE and specify Level I or II.

Send all inquiries to:

Frank Polimene
10 Shoreham Ct.
Baltimore, Md. 21236

THE BIT PICKER'S TOOLBOX

By Steve MacGregor, 3701 W Wetherfield, Phoenix, Arizona 85029

This routine multiplies the 16-bit positive number in BC by the 16-bit positive number in DE, and returns a 32-bit result, with the high-order 16 bits in DE and the low-order 16 bits in HL. The AF, BC, IX, and IY registers are returned unaltered.

```
4980 P5      MULT    PUSH AF
4981 3E10     LD      A,16
4983 210000   LD      HL,0
4986 29      M0      ADD  HL,HL
4987 EB      EX      DE,HL
4988 ED6A     ADC     HL,HL
498A EB      EX      DE,HL
498B 3004     JR      NC,M1
498D 09      ADD     HL,BC
498E 3001     JR      NC,M1
4990 13      INC     DE
4991 3D      M1      DEC  A
4992 20F2     JR      NZ,M0
4994 F1      POP     AF
4995 C9      RET
```

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Steve MacGregor
3701 W Wethersfield
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LIFE *LIFE* *LIFE* *LIFE* *LIFE* *LIFE* *LIFE*

January 27, 1979

R. Gordon Lloyd
7554 Southgate Rd.
Fayetteville, NC 28304

Dear Bob (and User's Group) --

Enclosed is a program (in BASIC!) which rennumbers Level II BASIC programs. In Level II, each BASIC line is preceded by 4 bytes: a 2-byte pointer to the next line, then 2 bytes which contain the line number. 16548-9 contain the addresses of the start of program text; 16633-4 the start address of simple variables; 16637-8 the start of free memory (see page D/2 in Level II Manual).

To rennumber a program with BASIC, you must fool the computer into loading it into high memory (above 22000D), as follows:

```
POKE 16548,240
POKE 16549,85
POKE 21999,0
NEW (PRINT MEM now gives 10701 in 16K)
CLOAD the program which you want to rennumber
```

Now enter SYSTEM, then /0 (computer replies "MEMORY SIZE?"). Press Enter, CLOAD (or type) the rennumbering program, and RUN. When it's done (several minutes for a long program), it will type two POKE instructions which you must then enter from the keyboard; then you type CLEAR. You can now LIST, CSAVE, and RUN the rennumbered program. To restore normal operation with full memory, enter SYSTEM and /0.

Note: all line numbers (new and old) must be less than 32768. The program is set up for 16K (non-disk). A little editing will squeeze it into 4K or adapt it for disk (these are left as exercises for the reader...)

Sincerely,

Phelps
H. Phelps Gates
6 Crestwood Tr. Pk. - Rt. 4
Chapel Hill
NC 27514
(919)-967-5193

```
10 'LEVEL II BASIC RENNUMBERING
20 'PHELPS GATES
30 '6 CRESTWOOD TR. PK. - RT. 4
40 'CHAPEL HILL, NC 27514 (919)-967-5193
50 CLEAR 20: DEFINT A-Z: DIM T(1000): M=0: ST=22000: N=ST+4
60 INPUT "NEW STARTING NUMBER"; S: INPUT "INCREMENT"; I
70 'COLLECT (IN ARRAY T) LINE REFERENCES AND THEIR LOCATIONS
80 'ZERO POINTER MARKS PROGRAM END (E IS ITS LOCATION)
90 P=PEEK(N): IF P=0 THEN IF PEEK(N+1)+PEEK(N+2)=0 THEN E=N+2: GOTO 210: ELSE N=N+5: GOTO 90
100 'LOOK FOR GOTO, GOSUB, THEN, ELSE ABBREVIATIONS
110 IF P>141 THEN IF P<145 THEN IF P<202 THEN IF P<149 THEN IF P<159 THEN N=N+1: GOTO 90
120 'SKIP SPACES BEFORE NUMBERS
130 N=N+1: IF PEEK(N)=32 THEN 130
140 IF (PEEK(N)>57) OR (PEEK(N)<48) THEN 90: '(NOT LINE NUMBER)
150 A="": FOR L=0 TO 5: A=A+CHR$(PEEK(N+L)): NEXT
160 T(N)=VAL(A): T(N+1)=N: N=N+2
170 'CHECK FOR COMPUTED GOTO/GOSUB
180 FOR L=1 TO 20: P=PEEK(N+L)
185 IF P=32 THEN NEXT ELSE IF P>57 THEN N=N+L: GOTO 130: ELSE IF P<48 THEN 90 ELSE NEXT
190 STOP: 'SOMETHING WRONG WITH TEXT IF WE REACH THIS POINT
200 'NOW CHANGE LINE NUMBERS
210 N=S-1: L=ST+2
220 N=N+1: N=N/256: NL=N-256*N: P=PEEK(L)
230 'PUT NEW # IN LINE'S NUMBER FIELD AND CHANGE ALL REFERENCES
240 '(IN # TABLE) TO THE NEW NUMBER (NEGATIVE, SO THEY DON'T
250 'GET CHANGED AGAIN)
260 TQ=P+256*PEEK(L+1): POKEL,NL: POKEL,L,HH: FOR R=0 TO M STEP 2: IF T(R)=T THEN T(R)=N: NEXT: ELSE NEXT
270 L=L+1
280 'SKIP TO END OF LINE (3 ZEROES MARK PROGRAM END)
290 L=L+1: IF PEEK(L) THEN 290 ELSE IF PEEK(L+1)+PEEK(L+2) THEN L=L+3: GOTO 220
300 'NOW CHANGE ALL REFERENCES. PROGRAM IS MOVED DOWN 256 BYTES
310 'TO ALLOW FOR EXPANSION IF NEW NUMBERS HAVE MORE DIGITS
320 L=ST: M=0: D=L-256
330 IF L>E THEN 330 ELSE IF T(M+1)<L THEN POKE D,PEEK(L): L=L+1: D=D+1: GOTO 330
340 A=MID$(STR$(T(M)),2): M=M+2: FOR R=1 TO LEN(A): POKE D,ASC(MID$(A,R,1)): D=D+1: NEXT
350 L=L+1: IF (PEEK(L)>47) AND (PEEK(L)<58) THEN 350 ELSE 330
360 'FINALLY ADJUST POINTERS (USR CALLS ROM SUBROUTINE AT 6304,
370 'WHICH FIXES UP LINE POINTERS). THIS LINE MUST NOT BE
380 'ENTERED AS SEPARATE LINES, OR CONTROL GETS LOST
390 HH=D/256: POKE 21743,0: POKE 16548,240: POKE 16549,84: PRINT "TYPE:"
400 PRINT TAB(10); "POKE 16633,"; D-256*HH: PRINT TAB(10); "POKE 16634,"; HH
410 PRINT TAB(10); "CLEAR": POKE 16527,26: POKE 16526,240: L=USR(0)
```

```
1 'HERE'S A SIMPLE BUT EFFECTIVE KEYBOARD DEBOUNCER FOR
2 'LEVEL 2: IT INSERTS A SHORT DELAY LOOP INTO THE ROM
3 'KEYBOARD SCAN (THE 7TH DATA ITEM CONTROLS DELAY LENGTH)
5 ' H. PHELPS GATES
6 ' 6 CRESTWOOD TR. PK. - RT. 4
7 ' CHAPEL HILL, NC 27514
8 ' (919)-967-5193
10 FOR N=16480 TO 16492: READ K: POKE N,K: NEXT
40 FOR N=16435 TO 16437: READ K: POKE N,K: NEXT
70 POKE 16405,0
80 DATA 205,227,3,183,200,14,20,16,254,13,32,251,201,195,96,64
90 NEW 'RUN PROGRAM AT POWER-UP... THE DELAY REMAINS AFTER YOU
100 'ERASE THE PROGRAM. (I DON'T THINK THIS WILL WORK WITH
110 'THE DISK - IT "STEALS" SPACE NEEDED BY DOS)
```